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Mobility Trends in the Fourth Industrial Revolution

Smart systems can help passengers by providing real-time train schedules. Photo exclusively licensed to ADB until 2021.
Disruptive innovation and technologies in transport are ushering smart processes, infrastructure, and operations, challenging regulators and raising passengers' expectations.

Published: 18 June 2020

Introduction

The world has entered the Fourth Industrial Revolution (4IR), which is defined as the "marriage of physical and digital technologies"[1] that creates cyber-physical systems of seamless automation and endless connectivity. Since the First Industrial Revolution in the 18th century, each subsequent industrial revolution has radically changed the urban mobility landscape. Through the 4IR, urban mobility trends are striving toward "smarter," safer, autonomous, and seamless travel.

In this digital era, advanced technologies, such as artificial intelligence (AI), big data analytics, the Internet of Things (IoT), and blockchain, are further cultivated to unlock unforeseeable opportunities in every aspect of life and are setting the trend in every industry. The 4IR is revolutionizing cities through smart farming, smart health care, smart grids, and last but not the least, smart mobility.

Many cities are targeting to bring smart mobility solutions as part of their smart city blueprint. Smart

mobility is beyond the application of information technology system (ITS); it is about responding to traffic issues and the mobility needs of the city with the ability to collect and plan with real-time data to optimize urban mobility services and operations.[2]

Four Key Trends

The 4IR is bringing a wave of smart processes, infrastructure, and operations into the urban mobility landscape. Here are four key trends we now see today:

1. **Smart payment: Cashless and cardless**

   The rise of contactless payment in transport is made possible using radiofrequency identification (RFID) or near field communication (NFC). The shift from cash and pre-purchase tickets to digital payment has provided seamless travel on public transport services, encouraging more commuters to use them. Digital payments make the payment process efficient and less prone to human error as they reduce the need for ticket booths, production of plastic or paper tickets, human resources, and dwell time. For some cities, smart urbanization means moving toward a cashless and cardless society.

2. **Smart booking system: Mobility-as-a-Service concept**

   Ease of payment has boosted booking via smartphone for mobility services. The system boomed from the last decade and was quickly adopted in Southeast Asia where digital activities have experienced exponential growth[3] due to high internet penetration (65%), social media penetration (63%), and mobile connectivity (132%).

   Together with technological innovations and the shift in cultural mindset to a "sharing or peer economy," the urban mobility sector has been disrupted by a wave of new mobility services players, such as Uber, Grab, GoJek, Didi, Ofo, and Lime.

   The convenience in booking a ride also encourages the concept of Mobility-as-a-Service (MaaS) as commuters are provided with a range of mobility options. According to the International Association of Public Transport (UITP), MaaS is the integration of and access to different transport services (such as public transport, ride-sharing, car-sharing, bike-sharing, scooter-sharing, taxi, car rental, and ride-hailing) in one single digital mobility platform, with active mobility and an efficient public transport system as its basis.[4] The concept of MaaS is being explored in Europe and North America. In the last 2 years, MaaS has reached Asia with Japan, Singapore, and Taipei,China being the first few in the region to try out the concept.

CURRENT SITUATION

MaaS MODEL

MaaS PROVIDER
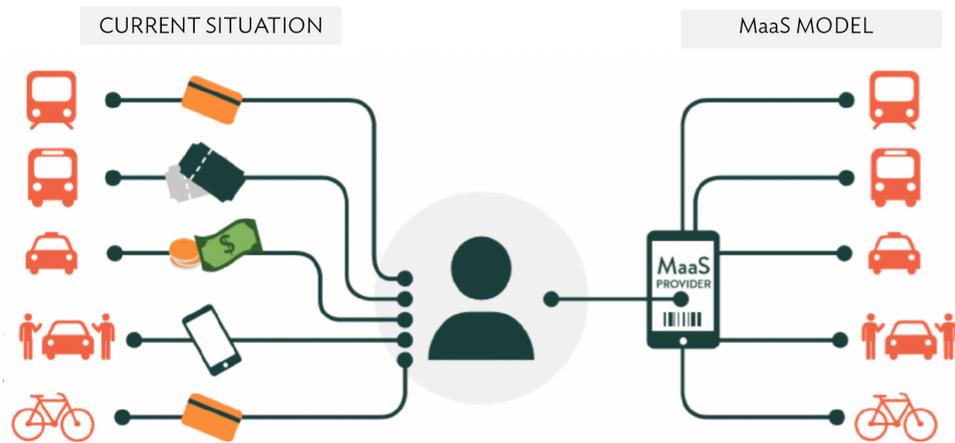
Source: M. Kamargianni and M. Matyas, 2016. Cited in UITP. 2019. Report: Mobility as a Service. Belgium. April.

3. **Smart multichannel customer service: 24/7 digital customer assistance**

Historically, commuters would get static information, such as a fixed bus or train schedules, from operators only at a specific time. AI, IoT, and sensor technologies have enabled mobility service providers to communicate transport-related information in real-time through tools, such as real-time bus/train arrival schedule, chatbots, optimal journey planner mobile applications, and recently, the in-station humanoid in Tokyo.

4. **Smart infrastructure: Creating multi-purpose and secure environments**

Technology pervades daily living through minicomputers, also known as smartphones, which are increasingly infused into the urban transport infrastructure. The term "smart station" has recently emerged in Asia where urban transport providers are beginning to understand that tech-savvy commuters want their travel time to be productive.

The 4IR is making futuristic mobility ideas a reality. Advanced digital technology will be further integrated into every asset, eliminating boundaries between physical and digital technologies. The challenge for Southeast Asia is how to meet the demands of users who are rapidly embracing technology. Are regulators ready for these trends?

Regulations that Keep Up with Technology

The 4IR will challenge urban mobility and transport planners and regulators more than ever. It is raising commuters' expectations, often with little or no tolerance for inefficient, uninformative, and inaccessible services. These expectations are:

- Greater demand for seamless mobility;
- Growth of shared micromobility market[5];
- Increasing demand for real-time information, including surveillance/videos and travel information **;**

- Growing need for contactless payment systems; and
- Increasing pressure to deliver 24/7 and customized customer assistance using automated and AI-powered solutions.

Due to these high expectations, regulators are faced with several challenges, with the following as the most pressing concerns:

1. **Non-traditional public transport service providers and investors are entering the market without regulators' involvement**. This can lead to conflicting interests in public transport operations, leaving regulators with the responsibility of managing safety and public nuisance issues. The rise and fall of dockless bikes across the globe is one of the examples of how a new market player enters the mobility market with little or no collaboration with the authorities to ensure the service is operating as a sustainable business model.
2. **Mobility data is becoming more personalized, identifiable, and predictable**. Operators and service providers are winning commuters' heart through seamless, personalized, and customized services. This leads to rising concern over use of data, data sharing, data privacy, and protection.
3. **Reliance on cloud computing for data storage raises concerns over cybersecurity**. The growth of IoT devices requires organizations to shift to the cloud for big data storage, processing, and analysis. Many cloud server-related breaches are due to cloud misconfiguration, which is a growing concern for the public transport sector as more assets and infrastructure are connected and more data on millions of commuters are collected.
4. **Concerns on the ethics of using AI and autonomous solutions are increasing**. Questions raised include whether the solutions are biased or ethically sound. For example, are AI solutions culturally sensitive and inclusive? Are there guidelines on how stakeholders can move forward with this technology?

Every stakeholder in the urban mobility ecosystem has a role to play to ensure the 4IR can flourish in cities.

- **Regulators need to help build the foundation for the 4IR** to encourage the development of innovative and safe mobility options and services for citizens. A flexible regulatory framework is being utilized in the public transport sector to ensure that it stays abreast with the latest mobility options without having new players compromise the existing system.
- **National and local authorities need to review the use of data and data sharing policies**. The public transport sector generates millions of data points each day for most cities. The governance of data is not a sole issue for the sector. It requires a collaborative effort across government agencies to set the framework on data governance.
- **Every individual and organization has a responsibility in training AI systems**. Implicit racial, gender or ideological biases can make their way into the AI systems, and influence decisions made by many public and private organizations. Therefore, end-users play a significant role in providing appropriate and constructive feedback to AI systems.
- **Multi-stakeholder collaborations are critical in developing effective, efficient, and sustainable mobility solutions**. Many of the successful mobility solutions require public-private partnerships to yield a win-win solution for all key stakeholders.

- **Public and private organizations need to prepare for tomorrow's workforce** because the jobs of 2030 may not exist today. There is a need to constantly review today's tasks to understand what skill sets may be eliminated in the future and learn how to prepare the workforce to be upskilled. Forward-thinking education strategies for every industry are necessary.

The 4IR has arrived and technology will continue to advance at a rapid pace. Cities need to raise awareness on the benefits, as well as vulnerabilities, the 4IR may bring. Urban mobility will continue to evolve with technology and usher in many opportunities and challenges for the sector.

Gayang Ho discussed the "Impacts of Emerging '4th Industrial Revolution' Urban Mobility Trends" during the Urban Transport for Livable Cities Forum held at the Asian Development Bank in October 2019.

[1]Deloitte Insight. 2018. *The Fourth Industrial Revolution Is Here—Are You Ready?* New York.

[2]Hong Kong, China Transport Department. 2019. *Smart Mobility Roadmap for Hong Kong, China.*

[3]ASEAN UP. 2019. *Southeast Asia Digital, Social and Mobile 2019*. 31 July.

[4]UITP. 2019. *Policy Brief: Ready for MaaS? Easier Mobility for Citizens and Better Data for Cities.* Belgium.

[5]K. Heineki et al. 2019. *Micromobility's 15,000-Mile Checkup*. McKinsey & Company. 29 January.

Resources

ASEAN UP. 2019. *Southeast Asia Digital, Social and Mobile 2019*. 31 July.

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